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(56) Documents cited

GB 2171614 A  
US 4609387 A

GB 2040722 A  
US 4061480 A

GB 1129169 A

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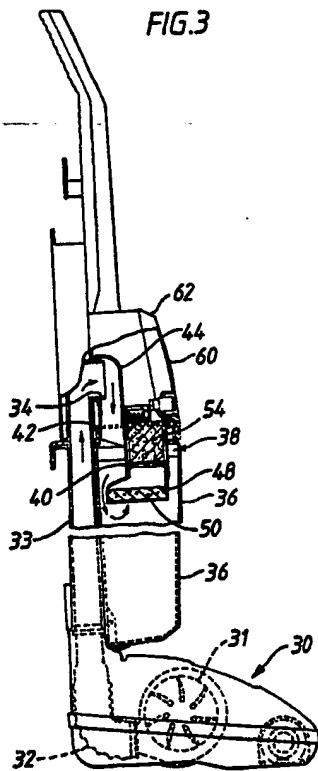
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## (54) Filter assembly for vacuum cleaners

(57) An upright vacuum cleaner comprises an impervious dust-collecting box 36 into which air is directed downwards from fan 31 and ducts 32-34, and from which the air exits via a coarse, foam plastic filter 50 followed by a fine filter cartridge 54. Cartridge 54 is removable for cleaning. Accumulated fluff falls from the lower, inlet face of filter 50 when the fan is switched off, into box 36, which is periodically emptied. The usual filter bag is not employed.

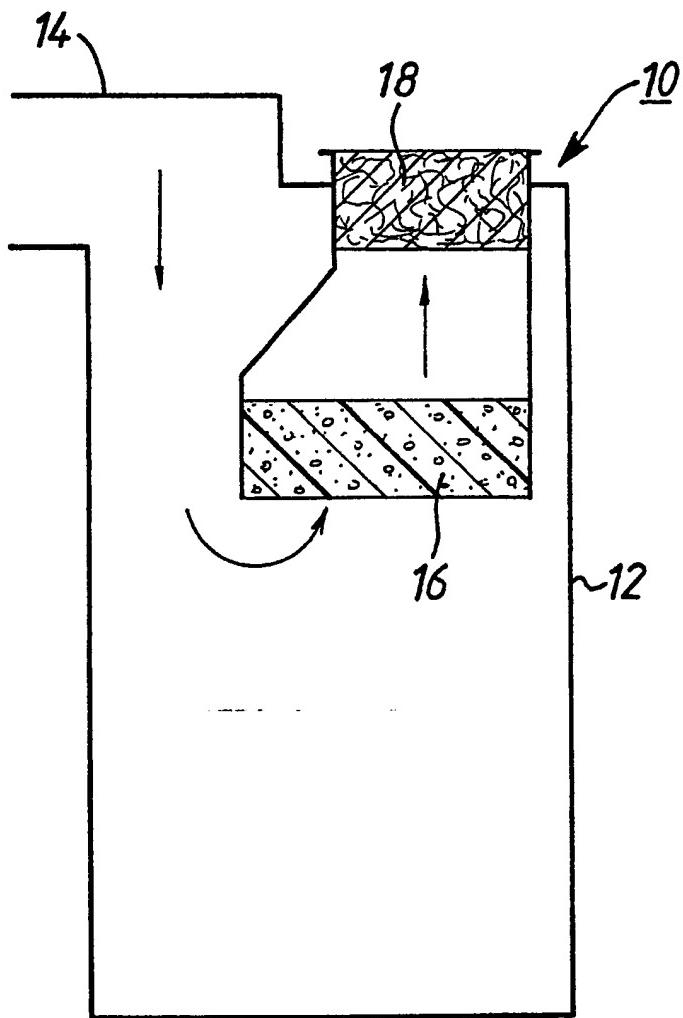
FIG.3



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FIG.1



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FIG. 2a

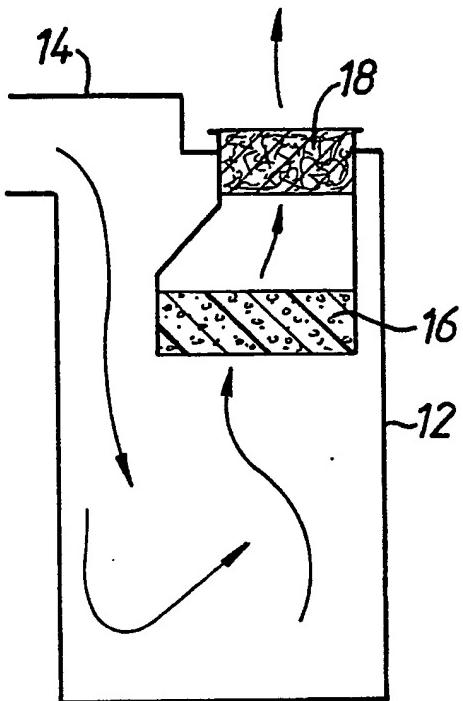


FIG. 2b

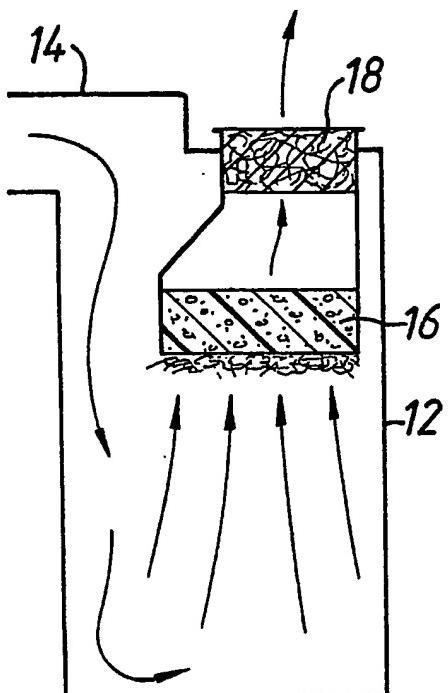
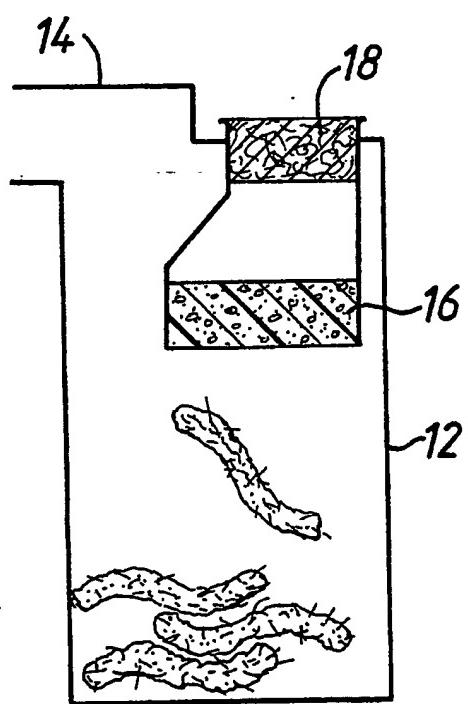
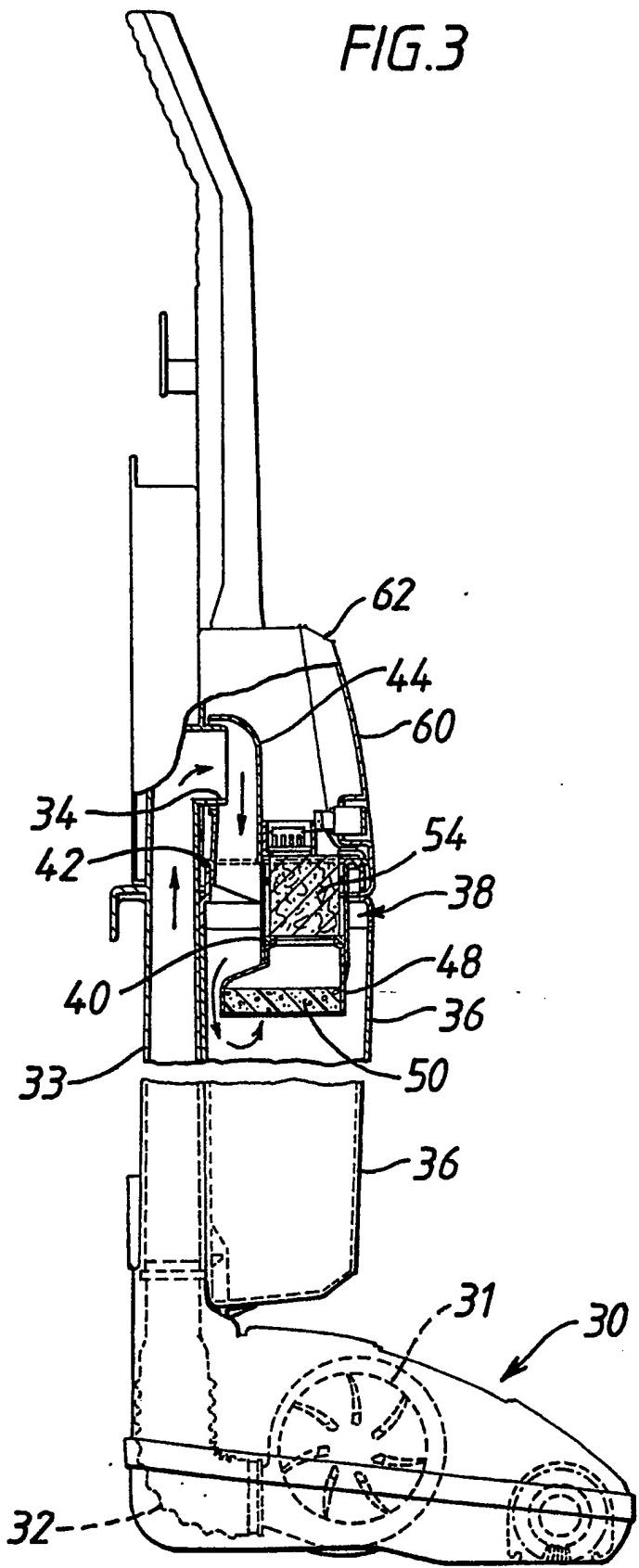


FIG. 2c



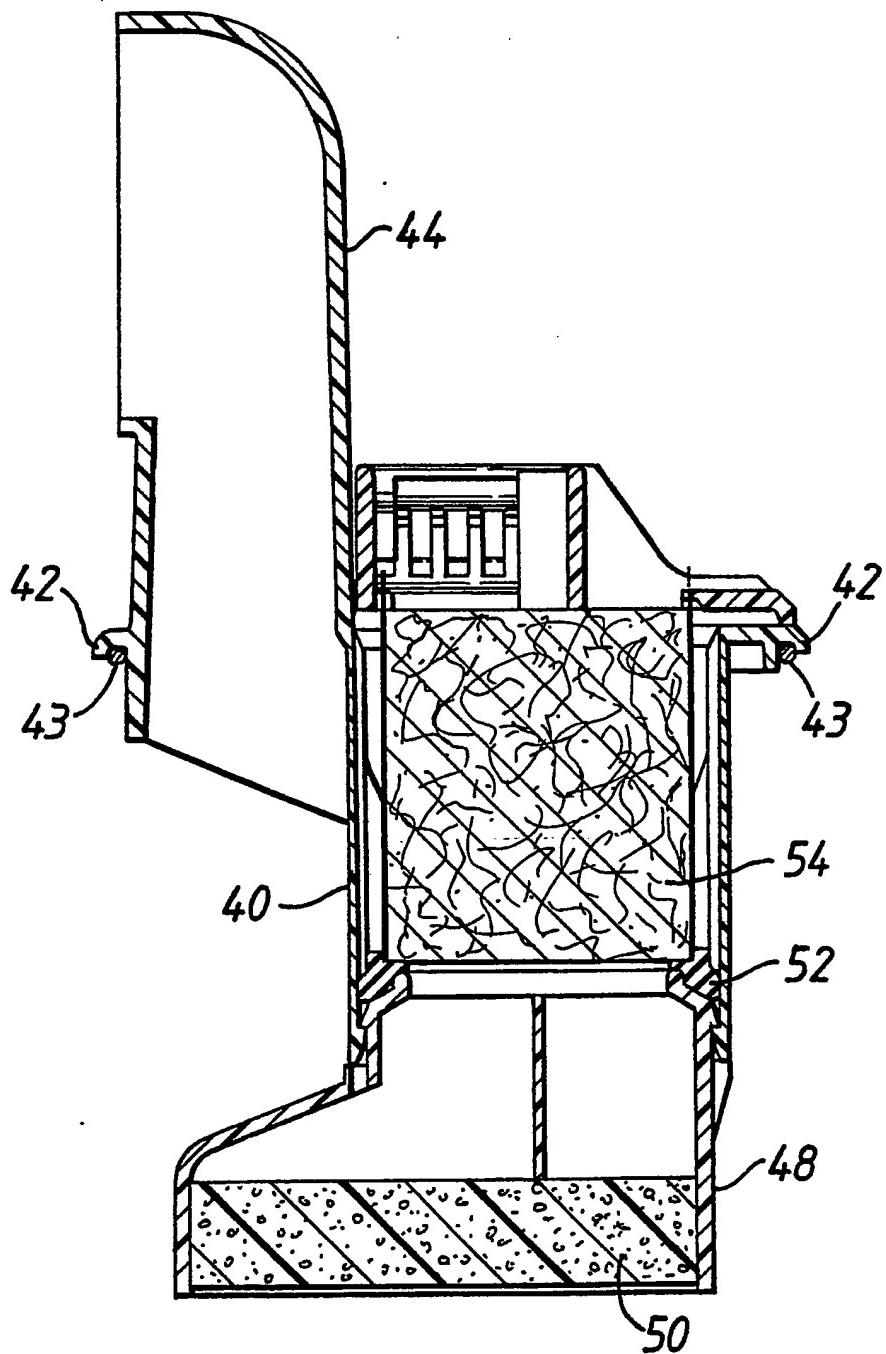
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FIG.3



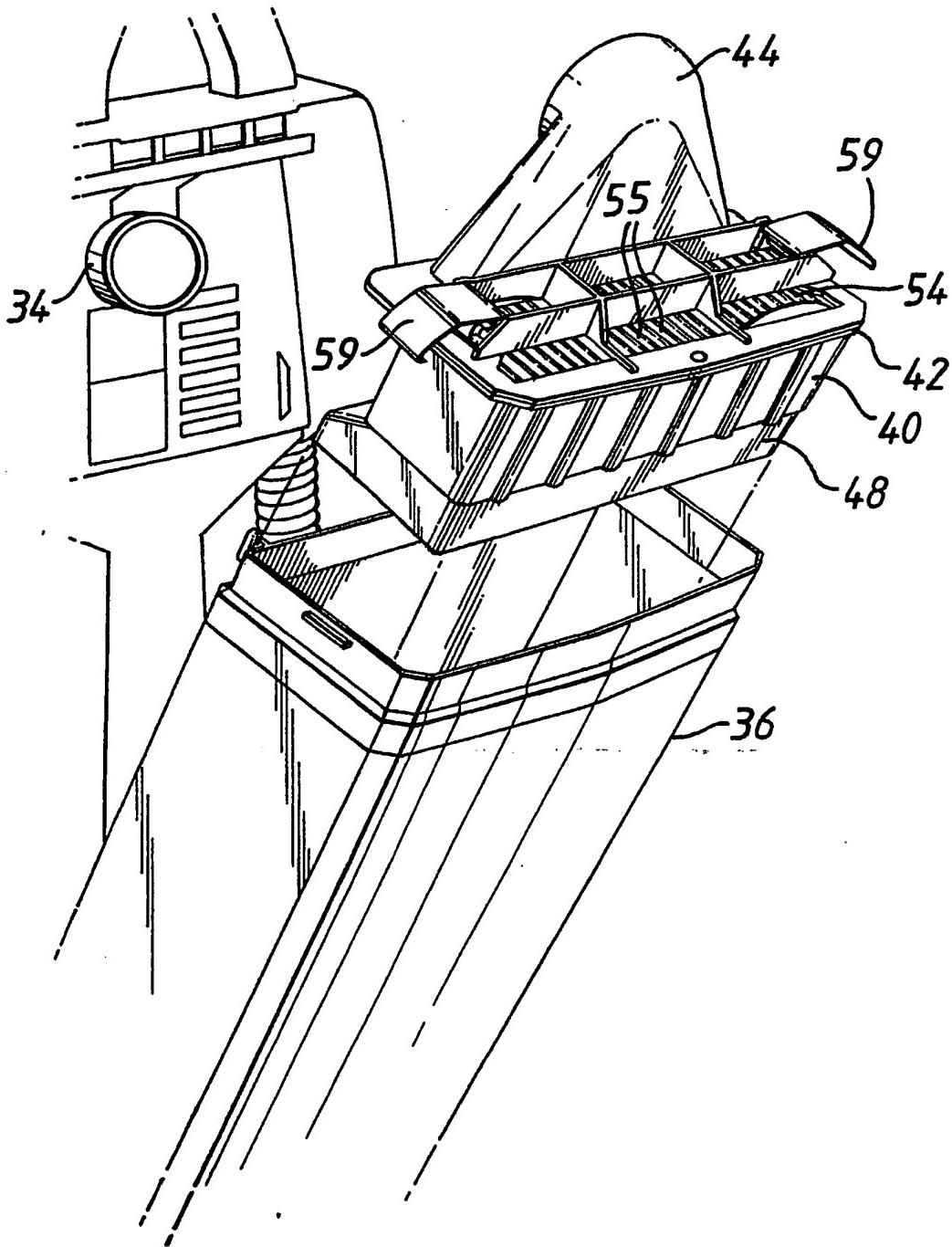
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FIG. 4



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FIG.5



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FILTER ASSEMBLY FOR  
VACUUM CLEANERS

5           This invention relates to filter assemblies for vacuum cleaners. The invention has particular application to filter assemblies for use in upright vacuum cleaners.

10          Conventional upright vacuum cleaners make use of disposable filter bags which are usually made of paper and act to remove debris such as grit, dust and fibre particles from the exhaust air of the cleaner. The present invention proposes a filter 15 arrangement which does not require the use of such a filter bag.

According to the present invention there is provided a filter assembly for a vacuum cleaner comprising a first relatively coarse filter element and a second relatively fine filter element, said filter elements, in use, being arranged in the flow of debris carrying air such that said air passes initially through said first filter element and then

through said second filter element. The first filter operates to extract relatively heavy debris from the air flow whilst the second filter extracts finer debris such as relatively fine dust and grit  
5 particles. The filter assembly will usually be mounted in a hermetically sealed container into the bottom of which debris can fall from the first filter. The first filter element may comprise an open-cell foam cartridge and the second filter element may  
10 comprise a disposable micro-filter cartridge.

The invention will be described now by way of example only, with particular reference to the accompanying drawings. In the drawings:

15

Figure 1 is a schematic illustration of a filter assembly in accordance with the present invention,

20

Figures 2A to 2C illustrate the operation of the filter assembly of Figure 1;

- 3 -

Figure 3 is a side elevation partly in section of an upright type vacuum cleaner incorporating a filter assembly in accordance with the present invention;

5

Figure 4 is an enlarged view of the filter assembly mounted in the vacuum cleaner of Figure 3, and

10

Figure 4 is an exploded view showing how the filter assembly is mounted in the dust container of the vacuum cleaner.

15

Referring to Figure 1 a filter assembly (10) is mounted in the outlet of a hermetically sealed container (12). The container (12) has an inlet (14) into which air carrying debris which has been picked up by the cleaner can flow.

20

The filter assembly (10) comprises a first relatively coarse filter (16) and a second relatively fine filter (18) which is mounted above the first filter (16). The first filter (16) may comprise an

open-cell foam filter cartridge. The second filter (18) may comprise a disposable microfilter cartridge.

In use when the cleaner is switched on  
5 debris carrying air flows rapidly into the container (12) through the inlet (14) (Figure 2a). This air then passes out from the container through the filter assembly (10). Initially the air flows through the first filter (16) which filters out relatively coarse debris materials such as fluff, fibres and other heavy matter. As this material is filtered out it begins to build-up on the lower surface of the first filter (16) and is held there against the force of gravity by the flow of air passing through the filter assembly (10).  
10 This is illustrated in Figure 2B of the drawings. The mat-like collection of debris is held against the lower filter surface as long as the cleaner is in operation. When the cleaner is switched off the air flow ceases and the mat-like build-up dislodges itself from the lower face of the filter (16) under the force of gravity and falls to the bottom of the dust container as illustrated in Figure 2C of the drawings.  
15 It will be appreciated that this operation occurs each time the cleaner is switched on and off. In cleaning  
20

a typical house a cleaner will be switched on and off several times, e.g. in moving from one powerpoint to the next, so it will be seen that the foam filter (16) is continually refreshed during use preventing serious 5 air restriction due to build-up of debris on its surface. This helps to maintain good cleaner performance.

Finer debris such as dust grit particles 10 which are able to pass through the filter (16) are arrested by the cartridge filter (18). This filter can be cleaned periodically by removing it from the cleaner and gently tapping it to cause the fine debris to fall from it. This action helps to extend the life 15 of the cartridge filter.

It will also be appreciated that, once the mat-like collection of debris has built-up on the lower surface of the filter (16), that filter also 20 operates to filter out a certain amount of the finer dust and grit particles which will subsequently fall to the bottom of the container (12) with the coarser material.

The filter (16), by virtue of the self-cleaning action described should maintain itself in a clean condition almost indefinitely, although it may be removed occasionally from the cleaner and 5 agitated to remove any hard build-up of debris from its surface.

It is believed that the arrangement described above which does not make use of filter bags 10 offers a higher standard of filtration than that currently provided by conventional bag filters. The self-cleaning property of the initial filter (16) prevents the filter assembly becoming severely restricted with fluff and carpet fibres and hence 15 prolongs the life of the filter assembly.

Figures 3 to 5 show an upright type vacuum cleaner which incorporates a filter assembly of the type described above. The cleaner comprises a base section (30) which accommodates a fan unit (31). Air sucked in by the fan unit is directed into a flexible conduit (32) and then up through a rigid generally 20 upright conduit (33). The upright conduit (33) terminates in a generally horizontally disposed outlet

(34). The outlet (34) is located above a box-like container (36) which is mounted forwardly of the conduit (33). The filter assembly is shown generally at (38) and is mounted at the upper end of the  
5 box-like container (36). The filter assembly (38) includes a moulded housing (40) which has a rectangular peripheral rim (42) which sits on the upper end edge of the box-like container (36). A seal (43) is disposed between the rim (42) and the upper  
10 end edge of the container so that the housing (40) is hermetically sealed with respect to the container (36). The housing also includes an upwardly extending section (44) which terminates around the outlet (34) and is sealed thereagainst by an annular rubber ring.  
15 The upper section (44) defines a passage for air exiting from the outlet (34) down into the container (36). The housing (40) also includes a lower section (48) which carries a filter element (50) which corresponds to the relatively coarse filter elements  
20 (16) shown in Figure 1. This filter element (50) is generally rectangular in cross-section and may be formed from reticulated open cell polyurethane foam with typically 30 pores per linear inch. The section (48) is suspended from the remainder of the housing

(40) and is sealed thereagainst by a seal (52). The housing (40) accommodates above the seal (50) a further filter assembly (54). This filter assembly corresponds to the relatively fine filter (18) shown in Figure 1. The filter (54), as can be seen in Figure 5 comprises a generally rectangular cartridge filter element which comprises a plurality of pleats (55). The housing (40) can be clipped to the container by clips (59). The cleaner includes a removable cover (60) which allows access to the filter assembly to permit, for example, replacement of the cartridge filter (54). At the upper end of the cover section (60) an aperture (62) is provided through which filtered air can escape.

Thus, in operation of the cleaner, dust laden air sucked in by the fan unit (31) is directed upwardly through the conduit (33) through the outlet (34), down the passage defined by section (44) and into the interior of the dust container (36) as shown by arrows in Figure 3. The air is then passed initially through the filter element (50) which operates as described for the filter element (16) with reference to Figures 1 and 2. The air then passes

through the cartridge filter (54) which operates in the manner described for the filter element (18) of Figures 1 and 2. The clean air then escapes through the outlet (62).

5

Dust collecting on the lower surface of the filter element (50) drops down into the container (36) where it is collected. The container (36) is removably mounted to the body of the cleaner, e.g. by a snap-fit connection so that it can be removed periodically to allow dust to be emptied. A significant feature of the cleaner described with reference to Figure 3 is that it does not need to employ a filter bag which is conventionally used in upright type vacuum cleaners.

10

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CLAIMS:

1. A filter assembly for a vacuum cleaner comprising a container which is attachable to or attached to the vacuum cleaner so that debris carrying air is caused to pass through the container, a first relatively coarse filter element and a second relatively fine filter element disposed in said container so that in use the flow of debris carrying air passes initially through said first filter element and then through said second filter element, the arrangement being such that debris halted by said first filter can be collected in said container.
- 15 2. A filter assembly according to claim 1, wherein the first filter operates to filter out from said air flow relatively coarse material which builds-up on the surface of the filter whilst the air flow is maintained and can fall therefrom when the air flow ceases.
- 20 3. A filter assembly according to claim 1 or claim 2, wherein the filter assembly is mounted in a debris collection container of a vacuum cleaner.

4. A filter assembly according to any preceding claim, wherein the first filter element is an open-cell foam cartridge filter.
5. A filter assembly according to any preceding claim, wherein the second filter element is a disposable microfilter cartridge.
6. A vacuum cleaner having a filter assembly according to any preceding claim.
7. A vacuum cleaner according to claim 6, wherein the cleaner is an upright type cleaner with an upstanding dust cabinet, the filter assembly being mounted at the upper end of the container.
8. A filter assembly substantially as hereinbefore described with reference to and as shown in the accompanying drawings.